DOCUMENT RESUME

ED 251 795 CS 007 844

AUTHOR Waller, Robert; Whalley, Peter
TITLE The Processing of Graphically Organised Prose.
PUB DATE Apr 84
NOTE 11p.; Paper presented at the Annual Meeting of the American Educational Research Association (68th, New Orleans, LA, April 23-27, 1984). Appendix A may be marginally legible.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS College Students; *Design Preferences; *Graphs; Higher Education; *Language Processing; Layout (Publications); Reading Comprehension; Reading Processes; *Reading Research; *Recall (Psychology)
IDENTIFIERS *Textual Organization

ABSTRACT

Given that comparative/contrastive arguments can be displayed separately in a text (one complete argument followed by another, or O-organization) or in an integrated way (with the various aspects interleaved, or A-organization), a study compared a third arrangement--a graphic format, or G-organization--that presented the two descriptions side by side in a tabular arrangement, with row and column headings. Subjects, 18 polytechnic students, were randomly assigned to the three text versions and were given 25 minutes in which to read the text. After the reading task, the subjects were distracted for 10 minutes by an unrelated symbol-identification task that required them to concentrate hard and work quickly. Finally, they were given 15 minutes to write a summary of the text as described in the instructions. Results showed that on general recall there were no significant differences between the three groups. On a comparative measure, however, the G-organization group scored significantly higher than the other two groups. Obviously, the graphic layout of the G-organized text made the comparative/contrastive structure of the argument much more obvious than either of the continuous prose versions. (HOD)

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THE PROCESSING OF GRAPHICALLY ORGANISED PROSE

Robert Waller, Peter Whalley
Institute of Educational Technology,
The Open University,
Milton Keynes MK7 6AA
Great Britain

AERA Annual Meeting, New Orleans, April 1984

Abstract

Comparative/contrastive arguments can be displayed separately (one complete argument followed by another) or in an integrated way (with the various aspects interleaved). A previous study showed that each arrangement has merits, depending on the readers' prior knowledge and task. This study compares a third arrangement - a graphic format - which it was thought might be equally suitable for a range of reading purposes. The results indicate that the graphic arrangement had a significant effect on the ability of students to produce an integrated explanation of competing arguments.

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Introduction

The practical context of the research

Recent research on the relationship between the design of a text and its comprehension has produced results which are of real significance to textbook authors (although some authors may feel that many of these results are simply confirmation of traditional ideas of good practice). We know, for example, that retention of an argument can be improved if its structure is explicitly signalled linguistically or typographically (reviewed by Duchastel, 1982).

A practical problem in applying the research is that it tends to suggest how authors can best present arguments to readers with particular levels of prior knowledge or particular learning objectives. This is fine if the author knows what these are, but not very helpful if s/he does not.

In a few situations, authors can make strong, detailed assumptions about their audience. Some courses are closely tied to particular textbooks, and students are exposed to few ideas from elsewhere. In these cases, the author just assumes certain specified prerequisite qualifications (or total ignorance) at the start of the book and builds from there; s/he can control the students' learning objectives by providing the teacher with appropriate assignments and activities contained in a teacher pack. Students are obliged by the institutional framework to act as a compliant, passive audience. However, considerable confusion can be observed when students need to use conventional linear text formats interactively. Whalley (1982), using a special apparatus to record study protocols of computer training manuals, found links between student performance and the accessibility of information.

At other times, however, the author cannot know in advance who may read his book and for what purposes - the institutional framework within which the book is used may be non-existent (ie, sales to the general public through bookshops), unpredictable (ie, sales to foreign educational systems), or deliberately unconstraining in its educational philosophy. Further characteristics of the non-compliant, selective reader are described elsewhere (Waller, 1979).

It is to attract the uncommitted and casual reader that publishers

of popular manuals and handbooks (on such topics as health, home-maintenance, hobbies etc) have in recent years developed a highly graphic style of text in which layout and typography is heavily used to structure the argument (Waller, 1982; Waller, in press). Each topic is displayed within separate pages or double-page spreads using multi-column layouts and bold headings.

The components of such pages often fit together so perfectly that it is obviously not accidental. Whereas in the normal publishing model books are laid out on the page after they have been handed over by the author, it is clear that in these graphic texts both processes - writing and design - have been done simultaneously. The design of the page can thus be integrated with other structuring techniques available to the writer (Figure 1 shows a typical example).

Figure 1. A page from the Open University text The Good Health Guide, Harper & Row, London, 1980. The rhythm of the argument is displayed through the headings ('Target...', 'Why?', 'By how much?', 'Watch these foods') and by the graphic arrangement of the three sets of information. Even when this page is read in a normal sequential manner, the graphic shape of the text affects its interpretation.

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This research was undertaken in the context of the Open University's continuing education programme. Community education courses (on subjects such as personal health, parenting, consumer rights, retirement etc) are aimed at the public at large, with no entry qualifications. Many of the students are not in the habit of reading long texts and so the courses use the graphic format described above.

Schnotz (1982) investigated the effect of alternative ways of presenting comparative/contrastive arguments on readers with different levels of prior knowledge. He found that the comparative processing of the two sets of ideas was encouraged by a particular text arrangement but discouraged by another.

Schnotz's text contains descriptions of two kinds of psychotherapy: psychoanalysis and behaviour therapy. One version (which Schnotz called 'organisation by object' or O-organisation) simply presents a description of one therapy followed by a separate description of the other. The second version (organisation by aspect, or A-organisation) interweaves the two descriptions. We used the same texts for our study, translated into English with a few minor alterations in style.

Schnotz found that readers did more comparative processing with the A- than with the O-organised text. The arrangement of the text clearly encourages that strategy. However, he also reported that readers with lower prior knowledge took longer to read the A-text. In assessing the practical implications of his results he therefore presents us with a trade-off. The first arrangement is best if comparative processing is required but worse if students have low prior knowledge. So what is an author to do if his/her text is to be used for a range of purposes by a heterogeneous group of readers?

This study introduces a third, graphic arrangement which, it was proposed, combines the merits of Schnotz's alternatives and so resolves the dilemma. It was thought that if the graphic layout of the argument allowed a range of reading strategies (in contrast to the linear strategy imposed by conventional prose), then the style of processing achieved would be a deliberate choice of the reader rather than a side-effect of the text arrangement. The third version (graphic, or G-organisation) presents the two descriptions side by side in a tabular arrangement, with row and column headings.

To avoid a possible order effect, two variants of each version were used: one started with psychoanalysis and the other started with behaviour therapy. The data for the two order-variants was combined for analysis.

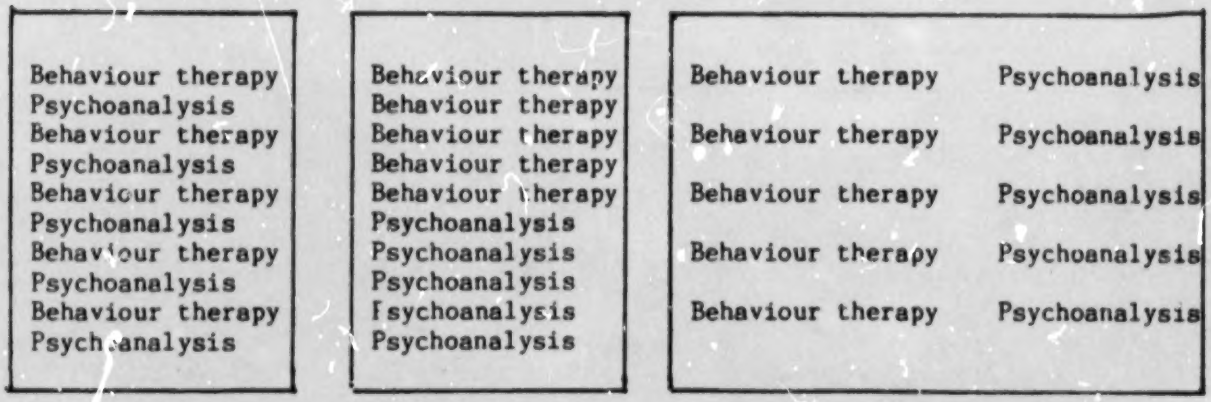

Figure 2. The structure of the three text versions. There were two sets of five parallel paragraphs on various aspects of the two kinds of therapy.

Figure 2 illustrates the difference between the A-, O- and G-organised texts. The full G version is shown in Appendix A. The other versions use identical paragraphs arranged in a conventional continuous-prose layout. While the G version was printed on one sheet of paper (220 x 340mm), the O- and A-organised versions each took exactly two pages of A4 paper (similar to the 8.5 x 11 used in the USA). They were photocopied on one side of the paper only and stapled at the top left corner.

In summary, it was hypothesised that G groups, reading the 'multi-

purpose' texts, would perform equally well as the best of the A or O groups on both measures: that is, that both A and G groups would score better on comparative measures than O groups; that both O and G groups would produce better general recall scores than A groups, reflecting the fact that both groups were able to read a single uninterrupted account of each kind of therapy.

Subjects

18 polytechnic students were randomly assigned to the three text versions. They were studying a range of subjects for a modular degree programme.

Instructions

Instructions were written on a whiteboard at the front of the room. Subjects were asked to read the text in such a way as to be able to summarise the content on behalf of another student later on, so that the notional 'other student' would be able to write an essay comparing psychoanalysis to behaviour therapy. The instructions were similar to those reported by Schnotz, for the same reason: to induce task-oriented learning.

Procedure

Students were given 25 minutes in which to read the text. Average reading times reported by Schnotz indicated that this would be adequate, although we did not measure differences in reading time. To ensure naturalistic conditions, the time allowed was greater than that needed for a single read-through. Students could thus reread the text several times, and they were permitted to take notes (about half of them did so). However, their notes were taken away before they did the recall task.

After the reading task, subjects were distracted for 10 minutes by an unrelated symbol-identification task which required them to concentrate hard and work quickly.

Finally, subjects were given fifteen minutes to write a summary of the text as described in the instructions.

Scoring

The essays were marked in two ways. General recall was marked using a simple scoring scheme: subjects were given marks for each of a list of main points which they reproduced correctly in their essays.

The degree to which students had integrated the two descriptions was measured by the number of transitions between them in the essays. For example, if students produced a completely O-organised essay, there would only be one transition between their description of psychotherapy and their description of behaviour therapy. If they produced an A-organised text, there would be many more transitions as they compared the two therapies along a range of attributes.

Results

On general recall, there were no significant differences between the three groups. On the comparative measure, however, the G group scored significantly higher than both the O and the A groups.

Text version	$\bar{x}$	SD
O	1.33	0.82
A	2	1.67
G	4.83	2.86

Table 1: Numbers of transitions in essays

A by O	0.88	
G by A	2.09	$p<.05$
G by O	2.88	$p<.05$

Table 2: T-tests

To some degree, these results correspond with those of Schnotz. That is, he also found no significant difference in general recall but

found that the A-group produced better comparative learning than the O-group. Our results, which use different measures, showed only a small but not statistically significant difference between the O- and the A-groups.

The most striking result was not predicted by us - the superiority of the G-group over both of the others on the comparative measure. The graphic layout of the G-organised text makes the comparative/contrastive structure of the argument much more obvious than either of the continuous prose versions. There is an input interpretation and an output interpretation. The first is that the graphic layout influenced the way the argument was memorised in the first instance; the second argues that a 'separate' memory of the structure of the text influenced the way that it was output in the essay task. That is, the tabular structure provides a mnemonic in a way that the two conventional prose versions - which look the same from a distance - do not. Jonassen (1984) demonstrated that graphic organisers (diagrammatic and pictorial overviews of the argument) can provide an effective 'ideational scaffold' on to which students can build as they read the detailed argument contained in instructional text. In our case it could be argued that the overall design of the page might in itself have provided a graphic organiser. Further studies would be necessary to determine which explanation is correct, and whether the effect is maintained over a long delay between study and recall.

Conclusions

The main hypothesis was confirmed - that the G-organised text would reduce Schnotz's trade-off between text organisation and type of learning. That is the G-version performed as well as the best of the others on both general recall and comparative structure.

In terms of general learning, there were no detrimental effects of the unusual G format. But it made a striking difference to subjects' perception of the contrastive nature of the argument they were reading. Since this intelligent integration of conflicting arguments is a major goal of many educators, this result has interesting implications for textbook designers. It reinforces other research on graphic access structures - for example, headings (Hartley 1981) and

structured writing (Horn 1982) - suggesting that typography could be a highly significant, if ill-understood, part of the writer's toolkit.

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Appendix A

	Behaviour therapy	Psychoanalysis
Theoretical principles	The general theoretical basis of behaviour therapy is found in behaviouristic learning theories. In these theories, learning is considered as a process by which the behaviour of an organism (humans or animals) changes as a function of an environmental situation. They assume that behaviour is determined by environmental cues: connections are supposed to exist between the stimuli of the environment (S) and the response of the organism (R). Learning occurs through changes in these SR connections. Such changes may be induced either by classical or operant conditioning. Classical conditioning presupposes the existence of some reflex-like SR connections. Another stimulus S+ which so far has been "neutral" is presented together with stimulus S. After several repetitions S+, too, can elicit the response R. In other words, a new connection, S+R, has been created. In operant conditioning the organism reacts to S by trying out several responses from its behavioural repertory. If one response R has a successful outcome, this increases the probability that in the future the response R will occur under condition S.	The general theoretical basis of psychoanalysis is Freud's personality theory. The model of personality assumed in this theory is based on conflict. Three aspects of personality are supposed to collide with each other: Id, Ego and Super-ego. Id represents the realm of impulses and needs, its energetic aspect consisting of an overall striving for pleasure called "libidinous energy". Super-ego stands for the rules and prohibitions imposed by society. It aims to restrict the power of Id or, alternatively, tries to direct the libidinous energy of Id into channels that are in keeping with social standards. Ego is responsible for the interaction with the external world and for conscious behavioural control. Its nature is determined – among other things – by the needs coming into consciousness from the Id and by the social standards emanating from Super-ego. Ego tries to create a balance between the two opposing sides. If, in the course of psychological development, very strong libidinous impulses are confronted with unrelenting prohibitions on the part of Super-ego, Ego may fail to manage its mediating function. In this case, the impulses threatening to overthrow the balance are repressed from consciousness. They may, however, continue to influence behaviour by reappearing in the guise of other impulses.
Neurotic disorder	A neurotic disorder is considered by behaviour therapy as a maladapted behaviour which has its origins in a learning process. Behaviour therapy proceeds on the assumption that "neurotic" behaviour is basically acquired along the same principles as "normal" behaviour and that both kinds of behaviour are amenable to change via learning. Accordingly, the principles of learning theory may not only explain how the condition originated but also suggest appropriate therapy. Therefore, behaviour therapy may be considered as the application of the principles of classical and operant conditioning from learning theory to the realm of neurotic disorders.	Neurotic disorder, according to psychoanalysis, is the result of repression. Its roots usually reach back into early childhood, during which "traumatic" (i.e. psychologically wounding) experiences occurred necessitating the repression of libidinous impulses and thus also increasing susceptibility to later traumatic experiences. The consequence of repression is the "psychological complex" which resides in the subconscious and is the actual cause of neurotic disorder. This complex constitutes the pool of energy responsible for the symptomatic behaviour and the persistence of the neurosis.
Neurotic symptoms	According to behaviour therapy, a neurotic symptom is simply considered as a maladapted behavioural habit resulting from erroneous learning. Behaviour therapy does not recognise any neurosis "behind" the symptom, merely the neurotic symptom itself: if the symptom is removed, the neurosis has disappeared too. "Therapy of the symptom" of this kind results in continuous improvement without danger of relapse or return of the "same" neurosis in the guise of other symptoms (symptom shifts).	Psychoanalysis believes that neurotic symptoms signal a deeper unconscious psychological complex. For psychoanalysis, symptoms represent the visible discharges of some hidden unconscious causes. It is only by removing these causes that the symptoms may be halted. According to psychoanalysis, a therapy which merely attempts to remove the symptoms may be quite successful for a limited period of time but, since the actual causes have not been removed, relapses occur after a while. Alternatively, it leads to "symptom shifts", i.e. the appearance of new symptoms caused by the same psychological complex.
Therapeutic principles	The fundamental principle of treatment in behaviour therapy is to use classical or operant conditioning to resolve ingrained SR connections which are inadequate and to replace them by more adequate ones. In the case of behaviours conflicting with the social standards of the culture in question, the therapist has the function of destroying the SR connections at the bases of these behaviours by encouraging alternative behaviours. If a desirable behaviour is merely lacking in a specific situation he will have to develop appropriate ways of reacting to this situation step by step. Treatment is confined to the behavioural habits exhibited by the patient in the present and dispenses with a far-reaching analysis of earlier experience.	The basic therapeutic principle in psychoanalysis aims to remove the psychological complex that lies behind any neurosis. This is done via the therapist who helps to bring back into consciousness the early experiences repressed into the unconscious so that they may be relived. Because of the importance attached to experiences of early childhood, psychoanalysis often concentrates on very remote aspects of the biography. The re-activation of suppressed experience is supposed to offer the possibility of repeating the original unsuccessful conflict of Ego with Id and Super-ego in a more constructive manner; this should thus lead to the resolution of the psychological complex. Removal of the unconscious origins leads at the same time to the disappearance of the problematic neurotic behaviours.
Scientific orientation	Behaviour therapy lies in the experimental scientific tradition and is rather sceptical towards hermeneutic interpretative approaches. On the basis of its fundamental learning theories, behaviour therapy may by means of deduction arrive at statements that are empirically testable. As behaviour therapy does not take very long the goals of the therapy are easy to determine beforehand. This also creates the possibility of evaluating success with a fair degree of objectivity.	Psychoanalysis belongs to in the main to a hermeneutic interpretative tradition of science. It attempts to interpret the verbal statements of the patient on his/her experiences and fantasies as a way of understanding how the neurotic disorder developed in retrospect. Psychoanalysis does not evaluate itself by a concept of empirical science. Individual therapy goals can rarely be determined in advance, since the objective is to treat the whole personality, taking into account a great many interacting factors. The psychoanalytical treatment usually lasts over several years; for this reason, too, it is difficult to objectively evaluate therapeutic success.

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